WHAT IS CLAIMED IS:

1. A method for generating a space-time trellis code (STTC) for maximizing space-time diversity gain and coding gain in a mobile communication system including at least two transmission antennas and generating a second number of STTC codes with an information data bit stream upon receiving the information data bit stream comprised of a first number of bits, the method comprising the steps of:

calculating a minimum effective length for each of the STTC codes;

calculating product distances between all STTC codes having a length equal to the minimum effective length, wherein for each of pairs of all initial states and all end states for each of the STTC codes, initial states are identical to end states;

summing reciprocals of the calculated product distances between all the STTC codes for each of the STTC codes, and calculating minimum average product distances by determining a reciprocal of the summation result; and

selecting as an STTC code corresponding to the information data bit stream an STTC code corresponding to a minimum average product distance having a maximum value among the minimum average product distances

2. The method of claim 1, wherein the minimum average product distance is calculated by

$$pd_{\delta,avg}^{-1} == \sum_{\text{all incorrect path of } \delta} \prod_{t \in \eta} \| c_t - c_t' \|^{-2}$$

where $pd_{\delta,avg}$ represents a minimum average product distance of an STTC code having a minimum effective length δ, η represents a set of all t's with $c_t \neq c_t$, c_t represents the STTC code, and c_t' represents a defective STTC code for the STTC code c_t.

3. The method of claim 1, wherein if the first number is 2 and a modulation scheme previously set in the mobile communication system is a 4-PSK (Phase Shift Keying) scheme, when an information data bit stream received at a

previous symbol time is 00 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 00122032 is selected; when an information data bit stream received at a previous symbol time is 01 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 02102230 is selected; when an information data bit stream received at a previous symbol time is 10 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 23310311 is selected; and when an information data bit stream received at a previous symbol time is 11 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 21330113 is selected.

4. The method of claim 1, wherein if the first number is 3 and a modulation scheme previously set in the mobile communication system is a 4-PSK scheme, when an information data bit stream received at a previous symbol time is 000 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 00201232 is selected; when an information data bit stream received at a previous symbol time is 001 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 01211333 is selected; when an information data bit stream received at a previous symbol time is 010 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 22023010 is selected; when an information data bit stream received at a previous symbol time is 011 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 23033111 is selected; when an information data bit stream received at a previous symbol time is 100 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 02221030 is selected; when an information data bit stream received at a previous symbol time is 101 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 03231131 is selected; when an information data bit stream received at a previous symbol time is 110 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC

code of 20003212 is selected; and when an information data bit stream received at a previous symbol time is 111 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 21013313 is selected.

5. The method of claim 1, wherein if the first number is 4 and a modulation scheme previously set in the mobile communication system is a 4-PSK scheme, when an information data bit stream received at a previous symbol time is 0000 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 00203212 is selected; when an information data bit stream received at a previous symbol time is 0001 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 02223010 is selected; when an information data bit stream received at a previous symbol time is 0010 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 21011333 is selected; when an information data bit stream received at a previous symbol time is 0011 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 23031131 is selected; when an information data bit stream received at a previous symbol time is 0100 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 12320020 is selected; when an information data bit stream received at a previous symbol time is 0101 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 10300222 is selected; when an information data bit stream received at a previous symbol time is 0110 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 33132101 is selected; when an information data bit stream received at a previous symbol time is 0111 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 31112303 is selected; when an information data bit stream received at a previous symbol time is 1000 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 20001232 is selected; when an information data bit stream received at a previous symbol time is 1001 and information data bit streams received at a

current symbol time are 00, 01, 10 and 11, an STTC code of 22021030 is selected; when an information data bit stream received at a previous symbol time is 1010 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 01213313 is selected; when an information data bit stream received at a previous symbol time is 1011 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 03233111 is selected; when an information data bit stream received at a previous symbol time is 1100 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 32122000 is selected; when an information data bit stream received at a previous symbol time is 1101 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 30102202 is selected; when an information data bit stream received at a previous symbol time is 1110 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 13330121 is selected; and when an information data bit stream received at a previous symbol time is 1111 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, an STTC code of 11310323 is selected.

6. An apparatus for generating a space-time trellis code (STTC) for maximizing space-time diversity gain and coding gain in a mobile communication system including at least two transmission antennas and generating a second number of STTC codes with an information data bit stream upon receiving the information data bit stream comprised of a first number of bits, the apparatus comprising:

a controller for calculating a minimum effective length for each of the STTC codes, calculating product distances between all STTC codes having a length equal to the minimum effective length, wherein for each of pairs of all initial states and all end states for each of the STTC codes, initial states are identical to end states, summing reciprocals of the calculated product distances between all the STTC codes for each of the STTC codes, calculating minimum average product distances by determining a reciprocal of the summation result; and as an STTC code corresponding to the information data bit stream an STTC encoder for receiving the information data

bit stream and generating as an STTC code of the information data bit stream an STTC code corresponding to the minimum average product distance

7. The apparatus of claim 6, wherein the controller calculates the minimum average product distance according to the following equation.

$$pd_{\delta,avg}^{-1} == \sum_{\text{all incorrect path of } \delta} \prod_{t \in \eta} \| c_t - c_t' \|^{-2}$$

where $pd_{\delta,avg}$ represents a minimum average product distance of an STTC code having a minimum effective length δ, η represents a set of all t's with $c_t \neq c_t'$, c_t represents the STTC code, and c_t' represents a defective STTC code for the STTC code c_t.

8. The apparatus of claim 6, wherein if the first number is 2 and a modulation scheme previously set in the mobile communication system is a 4-PSK (Phase Shift Keying) scheme, when an information data bit stream received at a previous symbol time is 00 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 00122032; when an information data bit stream received at a previous symbol time is 01 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 02102230; when an information data bit stream received at a previous symbol time is 10 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 23310311; and when an information data bit stream received at a previous symbol time is 11 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 21330113 is selected.

9. The apparatus of claim 6, wherein if the first number is 3 and a modulation scheme previously set in the mobile communication system is a 4-PSK scheme, when an information data bit stream received at a previous symbol time is 000 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 00201232; when an information data

bit stream received at a previous symbol time is 001 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 01211333; when an information data bit stream received at a previous symbol time is 010 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 22023010; when an information data bit stream received at a previous symbol time is 011 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 23033111; when an information data bit stream received at a previous symbol time is 100 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 02221030; when an information data bit stream received at a previous symbol time is 101 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 03231131; when an information data bit stream received at a previous symbol time is 110 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 20003212; and when an information data bit stream received at a previous symbol time is 111 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 21013313 is selected.

10. The apparatus of claim 6, wherein if the first number is 4 and a modulation scheme previously set in the mobile communication system is a 4-PSK scheme, when an information data bit stream received at a previous symbol time is 0000 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 00203212; when an information data bit stream received at a previous symbol time is 0001 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 02223010; when an information data bit stream received at a previous symbol time is 0010 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 21011333; when

an information data bit stream received at a previous symbol time is 0011 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 23031131; when an information data bit stream received at a previous symbol time is 0100 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 12320020; when an information data bit stream received at a previous symbol time is 0101 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 10300222; when an information data bit stream received at a previous symbol time is 0110 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 33132101; when an information data bit stream received at a previous symbol time is 0111 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 31112303; when an information data bit stream received at a previous symbol time is 1000 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 20001232; when an information data bit stream received at a previous symbol time is 1001 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 22021030; when an information data bit stream received at a previous symbol time is 1010 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 01213313; when an information data bit stream received at a previous symbol time is 1011 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 03233111; when an information data bit stream received at a previous symbol time is 1100 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 32122000; when an information data bit stream received at a previous symbol time is 1101 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 30102202; when an information data bit stream received at a previous

symbol time is 1110 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 13330121; and when an information data bit stream received at a previous symbol time is 1111 and information data bit streams received at a current symbol time are 00, 01, 10 and 11, the controller generates an STTC code of 11310323 is selected.